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PATENT

Attorney Docket No.: SSI-00700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Maximilian Albert Biberger *et al.*
Serial No.: 09/704,641
Filed: November 1, 2000
For: **METHOD AND APPARATUS
FOR SUPERCRITICAL PRO-
CESSING OF A WORKPIECE**

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

Enclosed please find an appeal brief in triplicate including 5 exhibits for filing with the U.S. Patent and Trademark Office. Also attached is a check in the amount of \$320.00 for filing the appeal brief.

The Commissioner is authorized to charge any additional fee or credit any overpayment to our Deposit Account No. 08-1275. An originally executed duplicate of this transmittal is enclosed for this purpose.

Respectfully submitted,

HAVERSTOCK & OWENS LLP

Dated: February 20, 2003

By Thomas B. Haverstock
Thomas B. Haverstock
Reg. No.: 32,571

Attorneys for Applicants CERTIFICATE OF MAILING (37 CFR § 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner for Patents, Washington D.C. 20231

- 1 -

HAVERSTOCK & OWENS LLP.

7-20-03 BY: Jean D. Ruscon



PATENT
Attorney Docket No.: SSI-00700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:) Group Art Unit: 1763
Maximilian A. Biberger et al.)) Examiner: Ram N. Kackar
Serial No.: 09/704,641)) APPEAL BRIEF
Filed: November 1, 2000)) 162 North Wolfe Road
For: **METHOD AND APPARATUS FOR**)) Sunnyvale, California 94086
SUPERCritical PROCESSING)) (408) 530-9700
OF A WORKPIECE))

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In furtherance of the Applicants' Notice of Appeal filed on December 23, 2002, this Appeal Brief is submitted herewith in triplicate. This Appeal Brief is submitted in support of the Applicants' Notice of Appeal filed on December 23, 2002, and further pursuant to the final rejection mailed on October 25, 2002. Claims 1-25, 29, and 30 have been rejected. The Applicants submit this Appeal Brief to the Board of Patent Appeals and Interferences in compliance with the requirements of 37 C.F.R. § 1.192. The Applicants contend that the rejection of Claims 1-25, 29, and 30 in this proceeding is in error and is overcome by this appeal.

CERTIFICATE OF MAILING (37 CFR § 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner for Patents, Washington D.C. 20231

- 1 -

HAVERSTOCK & OWENS LLP.

Date: 2-20-03 By: Frank D. Rausch

I. **REAL PARTY IN INTEREST**

As the assignee of the entire right, title, and interest in the above-captioned patent application, the real party in interest in this appeal is:

Tokyo Electron Limited
Akasaka 5-chome
Minato-ku
Tokyo 107-8481
Japan

This assignment results from a first assignment to Supercritical Systems, Inc., and a second, later assignment to Tokyo Electron Limited. The first assignment to

Supercritical Systems, Inc.
4160A Technology Drive
Fremont, California 94538-6360

is by the assignment documents recorded on March 6, 2001, on reel number 011598 and frame number 0592.

The second, later assignment to

Tokyo Electron Limited
Akasaka 5-chome
Minato-ku
Tokyo 107-8481
Japan

is by the assignment documents recorded on May 7, 2001, on reel number 011769 and frame number 0282.

II. RELATED APPEALS AND INTERFERENCES

The Applicants are not aware of any other appeals or interferences related to the present application.

III. STATUS OF THE CLAIMS

The pending U.S. Patent Application Serial Number 09/704,641 (the '641 patent application) was filed on November 1, 2000, and claims priority from a U.S. Provisional Patent Application filed on November 2, 1999. A first Office Action was mailed on September 27, 2001, entering a restriction requirement. In an Amendment and Response to Restriction Requirement Mailed on September 27, 2001, filed on October 17, 2002, the Applicants canceled claims 26-28. In a second Office Action mailed April 3, 2002, claims 1-25, 29, and 30 were rejected under 35 U.S.C. § 112, first paragraph, and 35 U.S.C. § 103. An Amendment and Response to Office Action Mailed on April 3, 2002, was filed on October 2, 2002. A Final Office Action was mailed on October 25, 2002, rejecting Claims 1-25, 29, and 30 under 35 U.S.C. § 112, first paragraph, and 35 U.S.C. § 103. The claims included in the Appendix are consistent with the entered amendments made during the examination of the pending application.

The rejection of Claims 1-25, 29, and 30 is being appealed.

IV. STATUS OF THE AMENDMENTS FILED AFTER FINAL REJECTION

No amendments have been filed after the final Office Action mailed on October 25, 2002.

V. SUMMARY OF THE INVENTION

As stated in the Summary of the Invention in the '641 patent application, at page 4, lines 18-29:

The present invention is an apparatus for supercritical processing and non-supercritical processing of a workpiece. The apparatus includes a transfer module, a supercritical processing module, a non-supercritical processing module, and a robot. The transfer module includes an entrance. The supercritical processing module and the non-supercritical processing module are coupled to the transfer module. The robot is preferably located within the transfer module. In operation, the robot transfers a workpiece from the entrance of the transfer module to the supercritical processing module. After supercritical processing, the robot then transfers the workpiece from the supercritical processing module to the non-supercritical processing module. After the non-supercritical processing, the robot returns the workpiece to the entrance of the

transfer module. Alternatively, the non-supercritical processing is performed before the supercritical processing.

VI. ISSUES

The following issues are presented in this Appeal Brief for review by the Board of Patent Appeals and Interferences:

1. Whether Claims 1-25, 29, and 30 are properly rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and use the invention.
2. Whether Claims 1-17, 19-20, 22-25, and 29 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Number 6,110,232 to Chen *et al.* (“Chen”) in view of U.S. Patent Number 5,979,306 to Fujikawa *et al.* (“Fujikawa”).
3. Whether Claims 18 and 21 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa as applied to Claim 16, and further in view of U.S. Patent Number 5,928,389 to Jevtic (“Jevtic”).
4. Whether Claim 30 is properly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Number 5,882,165 to Maydan *et al.* (“Maydan”) in view of Fujikawa.

VII. GROUPING OF THE CLAIMS

The claims pending on appeal in this proceeding do not stand or fall together.

Regarding the rejection of Claims 1-17, 19-20, 22-25, and 29 under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa, Claims 1-17, 19-20, 22-25, and 29 stand or fall together.

Regarding the rejection of Claims 18 and 21 under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa as applied to Claim 16, and further in view of Jevtic, Claims 18 and 21 stand or fall together.

VIII. ARGUMENT

A. THE REJECTION UNDER 35 U.S.C. § 112, FIRST PARAGRAPH, IS IN ERROR.

Claims 1-25, 29, and 30 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains or with which it is most nearly connected, to make and use the invention. In the First Office Action, mailed April 3, 2002, it was stated, "Specifically, the applicant has not disclosed the structural requirements for high pressure seals and fittings and fixturing for work piece holding needed for connecting the super critical module to the transfer module." The Applicants responded to this ground for rejection in the Response to the Office Action Mailed on April 3, 2002, filed on October 2, 2002. The rejection was maintained in the Final Office Action mailed October 25, 2002, apparently giving additional reasons for the rejection: "Specifically, the applicant has not disclosed the details of claimed structural improvements over the high pressure or supercritical modules of the prior art to integrate the claimed supercritical module to a cluster tool.¹ For example, the structural improvements to eliminate cross contamination and gas leakage is not described."

- 1. The specification describes the invention sufficiently to enable one skilled in the art to make and use it.**

Under Federal Circuit law, a patent application satisfies 35 U.S.C. § 112, first paragraph, if its specification enables one skilled in the art to make and use the invention disclosed in the patent application. *Atlas Powder Co. v. E.I. Du Pont De Nemours & Co.*, 750 F.2d 1569, 1576 (Fed. Cir. 1984). As stated in the M.P.E.P.: "Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention." M.P.E.P. § 2164 (8th ed. 2001). The Federal Circuit has recently repeated the policy behind this:

¹As used in this Appeal Brief, a cluster tool is a processing system comprising a transfer chamber and two or more processing modules coupled to the transfer chamber. The transfer chamber is used to transfer a workpiece between the processing modules.

The law is clear that patent documents need not include subject matter that is known in the field of the invention and is in the prior art, for patents are written for persons experienced in the field of the invention. To hold otherwise would require every patent document to include a technical treatise for the unskilled reader. Although an accommodation to the “common experience” of lay persons may be feasible, it is an unnecessary burden for inventors and has long been rejected as a requirement of patent disclosures.

S3 Inc. v. Nvidia Corp., 259 F.3d 1364, 1371 (Fed. Cir. 2001) (citations omitted, underlining added). *See also Martin v. Johnson*, 454 F.2d 746, 752 (C.C.P.A. 1972) (“Enablement is the criterion, and every detail need not be set forth in the written specification if the skill in the art is such that the disclosure enables one to make the invention.”). Moreover, a patent application can be enabling even if, after reading the specification, one skilled in the art must perform some experimentation to make or use the invention. *Atlas Powder Co.*, 750 F.2d at 1576; *see also* M.P.E.P. § 2164.01. Thus, any analysis under 35 U.S.C. § 112, first paragraph, must be from the point of view of one skilled in the art. As described in more detail below, the Applicants have submitted a declaration from one skilled in the art, supporting the conclusion that one skilled in the art would know how to make and use the invention after reading the ‘641 patent application.

Courts recognize that one skilled in the art is best qualified to state what others skilled in the art know. Affidavits may be used to show whether one skilled in the art would, after reading the specification, know how to make and use the invention. Under the rules governing practice before the U.S. Patent Office, “[a] declaration or affidavit is, itself, evidence that must be considered.” M.P.E.P. § 2164.05(8th ed. 2001) (underlining in original). Indeed, courts routinely use declarations and affidavits to help them determine the level of skill in the art. *See, e.g., Martin v. Johnson*, 454 F.2d 746, 752 (C.C.P.A. 1972) (relying in part on affidavit to find that application was enabling).

Those skilled in the art routinely find operating conditions sufficient to practice an invention. Courts have recognized this. Thus, for example, in *Martin*, 454 F.2d 746, Martin challenged a Board of Patent Interference’s decision that a series of Johnson’s patents, drawn to a herbicidal compound, were enabling. Specifically, Martin alleged that Johnson’s patents “fail[ed] to disclose any method of making the count compound thereby failing to satisfy the how-to-make requirement of 35 U.S.C. § 112, first paragraph.” *Id.* at 748 (underlining omitted). The Board found that it sufficed that the patent taught “temperatures and times and solvents” and that those parameters were “within the purview of one skilled in the art who could readily determine the same to produce the compound of the count with a minimum amount of

experimentation.” *Id.* at 749. The Court of Custom and Patent Appeals agreed, relying in part on an affidavit of a chemist who gave evidence on the state of the skill in the art. *Id.* at 751-52. As described in more detail below, the ‘641 patent application specifies operating conditions needed to practice the present invention, and one skilled in the art has declared that after reading this information he could practice the invention. The Examiner has improperly substituted his opinion for that of one skilled in the art to conclude that one skilled in the art could not practice the invention after reading the ‘641 patent application.

The present invention is drawn to a supercritical module used for supercritical processing of a workpiece, a non-supercritical module used for non-supercritical processing of a workpiece, and a transfer module coupled to both the supercritical module and the non-supercritical module. ‘641 Patent Application, page 4, lines 18-29. The transfer module is used to transfer a workpiece between the supercritical module and the non-supercritical module. *Id.* In one embodiment, a workpiece, such as a semiconductor wafer, is placed in the transfer module. *Id.*, page 7, lines 27-29. The workpiece is then transferred to the non-supercritical module where the workpiece undergoes non-supercritical processing. *Id.* For example, the workpiece may have a dielectric etch performed on it. *Id.* Next, the workpiece is transferred back to the transfer module, and from there to the supercritical module, where a supercritical process is performed on it. *Id.*, page 7, line 29 to page 8, line 1. For example, the workpiece can undergo supercritical cleaning to remove etch residue from the surface of the workpiece. *Id.* As described in more detail below, the supercritical cleaning process requires that specific temperatures and pressures be maintained. Also, as described below, one embodiment requires that steps be taken to ensure that cross-contamination between the modules is eliminated and that leakage is minimized.

The ‘641 application teaches temperatures and pressures used to practice one embodiment of the present invention. For example, the ‘641 application states, at page 9, line 22, to page 10, line 9:

During the second step 54, the carbon dioxide is heated by the carbon dioxide heater 148 while the pressure chamber 136 is heated by the pressure chamber heater 150 to ensure that a temperature of the carbon dioxide in the pressure chamber 136 is above a critical temperature. The critical temperature for the carbon dioxide is 31 °C. Preferably, the temperature of the carbon dioxide in the pressure chamber 136 is within the range of 45 °C to 75 °C. Alternatively, the temperature of the carbon dioxide in the pressure chamber 136 is maintained within a range of 31 °C to about 100 °C.

Upon reaching supercritical conditions, the first injection pump 159 pumps the solvent from the chemical supply vessel 138 into the pressure chamber 136 via the circulation line 152 while the carbon dioxide pump further pressurizes the supercritical carbon dioxide in the third process step 56. At the beginning of a solvent injection, the pressure in the pressure chamber 136 is preferably about 1,100-1,200 psi. Once a desired amount of the solvent has been pumped into the pressure chamber 136 and desired supercritical conditions are reached, the carbon dioxide pump 134 stops pressurizing the pressure chamber 136, the first injection pump 159 stops pumping the solvent into the pressure chamber 136, and the circulation pump 140 begins circulating the supercritical carbon dioxide and the solvent in the fourth process step 58. Preferably, the pressure at this point is about 2,700-2,800 psi.

In the Amendment and Response to Office Action Mailed on April 3, 2002, the Applicants submitted the Declaration of Dr. Mehrdad Moslehi Under 37 C.F.R. § 1.132 to Overcome Rejections Under 35 U.S.C. § 112, ¶ 1, and 35 U.S.C. § 103 ("Moslehi Decl." attached hereto as Attachment 7). Dr. Moslehi is one skilled in the art in the area of semiconductor device fabrication.² Dr. Moslehi reviewed the '641 application and found:

On the filing date (November 1, 2000)³, a person who was skilled in the art and had read the '641 patent application would have known the structural requirements for making the high-pressure process chambers (pressurized vessels) disclosed in the '641 patent application. After reading the '641 patent application the person would know how to choose and assemble the seals, fittings, and workpiece fixturing that form the process chambers and cluster tool described in the '641 patent application. To do this, one skilled in the art needs only the operating pressure and temperature ranges, as are disclosed, for example, at pages 9-10 of the '641 patent application.

High-pressure process chambers were known to those skilled in the art on the filing date, and were even manufactured then (e.g., Fujikawa). As another example, Gasonics (recently acquired by Novellus) introduced a commercial high-pressure thermal processing system for high-pressure oxidation applications over 17 years ago. In addition, between 1988 and 1994 as part of its Microelectronics Manufacturing Science and Technology (MMST) program, Texas Instruments developed (in collaboration with Gasonics) a single-wafer high-pressure thermal processing process module capable of

²As explained in more detail in his declaration, Dr. Moslehi has worked in the area of semiconductor device fabrication and cluster tools for the past twenty-two years. [Moslehi Decl. ¶¶ 2-10]. Dr. Moslehi's status as one skilled in the art was not challenged in the Final Office Action.

³The Moslehi Declaration refers only to the filing date as November 1, 2000. However, the '641 application claims priority from U.S. Provisional Patent Application Number 60/163,121, filed on November 2, 1999. Accordingly, the effective filing date for the '641 application is November 2, 1999.

mounting on or connecting to a wafer transfer chamber. However, none of these prior art chambers contemplated a cluster tool that combined supercritical processing modules, or even high-pressure modules, with low-pressure modules.

While none of these high-pressure processing systems were designed for or were suitable for supercritical process applications, the structural design requirements for the non-supercritical and supercritical high-pressure processing systems are essentially similar. Techniques known on the filing date could have been used to specify the appropriate sealing, fitting, fixturing, and structural requirements for the supercritical processing module disclosed in the '641 patent application. Using these techniques, one skilled in the art can take the temperature and pressure that a processing chamber must withstand, and from these determine the appropriate sealing, fitting, fixturing, and structural requirements for the supercritical processing module. SSI's patent application discloses the operating temperature and pressure ranges of the supercritical processing module. Therefore, on the filing date, one skilled in the art would have been able to design the fittings, seals, process chamber structural requirements and the fixturing for connecting the supercritical process module to the transfer module to withstand the combination of specified pressures and temperatures.

Moslehi Decl., ¶¶ 23-25. As one skilled in the art, Dr. Moslehi asserts that after reading the '641 application, he would be able to make and use the invention. Accordingly, under the authority described above, the '641 patent application satisfies the requirements of 35 U.S.C. § 112, first paragraph. The rejection under 35 U.S.C. § 112, first paragraph, is improper and should be withdrawn.

2. The Final Office Action mistakenly suggests that Dr. Moslehi's affidavit contains inconsistent statements.

Within the Final Office Action, it is stated that Dr. Moslehi's declaration makes inconsistent statements:

Paragraph 22-25: In trying to overcome the 35 USC § 112 first paragraph rejection, the declarant has asserted that the structural design for the non-supercritical and supercritical high pressure processing systems were essentially similar. This assertion is inconsistent with what is stated in paragraph 13 and further in paragraph 26.

Here, the Final Office Action mischaracterizes statements in Dr. Moslehi's declaration. In paragraph 13 of his declaration, Dr. Moslehi states:

[T]he specific engineering problems and issues associated with vacuum-integrated or atmospheric cluster tools, as disclosed in the cited prior art, are substantially different from the design considerations and problems associated with specialized cluster tools that combine a high-pressure supercritical processing module and a low-pressure (or sub-atmospheric pressure) non-supercritical processing module, as disclosed in the '641 patent application.

Moslehi Decl., ¶ 13.

In paragraph 26 of his declaration, Dr. Moslehi first states that the '641 patent application identifies the motivation for combining a supercritical processing module and a non-supercritical processing module on a single cluster tool. [Moslehi Decl., ¶ 26] Dr. Moslehi further states: "Without this motivation, one skilled in the art would not be inclined to integrate two vastly different processing modules (in terms of operating pressures) on one cluster tool platform since this type of integration presents special integration challenges in terms of cross-contamination and throughput." *Id.*

Contrary to the assertion stated in the Final Office Action, the statements in paragraphs 22-25 are not inconsistent with those in paragraphs 13 and 26. In paragraphs 22-25, Dr. Moslehi states that high-pressure processing chambers were known in the art on the filing date. [Moslehi Decl. ¶ 24] Dr. Moslehi states that some of these high-pressure processing modules were capable of being mounted on or connected to a transfer chamber. *Id.*, ¶ 24. Dr. Moslehi thus describes the state of the art on the filing date, concluding that after reading the '641 patent application, one skilled in the art would know how to connect a supercritical processing module to a transfer module as claimed in the '641 patent application. *Id.*, ¶ 23. Dr. Moslehi concludes, however, that "none of the prior art chambers contemplated a cluster tool that combined supercritical processing modules, or even high-pressure modules, with low-pressure modules." *Id.*, ¶ 24. These conclusions are not inconsistent.

Within the Final Office Action it is suggested that because similar designs are found in the prior art, the '641 patent application cannot contain patentable subject matter. The Federal Circuit has rejected this reasoning, stating: "Virtually all inventions are necessarily combinations of old elements. The notion, therefore, that combination claims can be declared invalid merely upon finding similar elements in separate prior art patents would necessarily destroy virtually all patents and cannot be the law under the statute, § 103." *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1575 (Fed. Cir. 1987), *cert. denied*, 481 U.S. 1052 (1987).

Within the Final Office Action it is stated, "Paragraph 16: Again, contrary to declarant's assertion, the specification does not teach how to reliably integrate high pressure (supercritical)

and low pressure (non supercritical) processing modules on a cluster tool platform. On the other hand operational issues have been disclosed extensively" (underlining added). As described above, after reading the parameters described in the '641 patent application, which it is admitted have been disclosed extensively, one skilled in the art would have known how to connect a supercritical module and a non-supercritical module to a transfer module, as disclosed in the '641 patent application.

Throughout the Final Office Action, it is also stated that the '641 patent application does not disclose the engineering and design considerations associated with cluster tools comprising a supercritical and a non-supercritical processing module. (See discussion in Final Office Action related to Paragraphs 13 and 14 of Dr. Moslehi's declaration.) Moreover, in relation to Paragraph 26 of Dr. Moslehi's declaration, it is stated within the Final Office Action that "[t]he declarant has referred to the need for motivation for combining two different types of modules on a common cluster tool platform since this presented special engineering challenges. Again, applicant has not disclosed how those challenges are overcome."

This is not true. For example, in paragraph 31 of his declaration, Dr. Moslehi states:

Another feature disclosed in the '641 patent application is the use of an ante-chamber (dependent claim 18) as an isolation or buffer chamber separating the supercritical module from the transfer chamber. This will further eliminate the chance of cross-contamination and leakage from the supercritical processing module to the non-supercritical processing modules.

Here, Dr. Moslehi discusses some of the engineering and design issues related to combining a supercritical processing module and a non-supercritical processing modules on a common transfer module. Elsewhere, Dr. Moslehi notes that none of the cited prior art teaches using an ante-chamber to address these engineering and design issues. [Moslehi Decl. ¶ 17]

Elsewhere, the '641 patent application describes the sequence of steps required to perform supercritical and non-supercritical processing steps on a single cluster tool. *See, e.g.*, Moslehi Decl. ¶ 16; '641 patent application at page 9, line 18 to page 11, line 10. The '641 patent application thus teaches design and process steps that are sufficient to practice the invention described in it.

For the above reasons, Dr. Moslehi asserts that the '641 patent application as filed adequately describes the engineering and design considerations recognized and implemented by the present invention.

B. THE CLAIMS IN THE '641 APPLICATION ARE NONOBVIOUS IN LIGHT OF THE CITED PRIOR ART.

1. Claims 1-17, 19-20, 22-25, and 29 are nonobvious over Chen in view of Fujikawa.

Within the Final Office Action, Claims 1-10, 13, 15-17, 19-20, 22-25, and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa. Specifically, within the Final Office Action it is stated that “it would have been obvious to one having ordinary skill in the art at the time [the] invention was made to couple the supercritical module to the transfer module of Chen et al to combine [a] supercritical processing step with other processing on a wafer without taking the wafer out of [a] clean environment between steps to have higher throughput.” However, as described below, on the filing date it was not obvious to one skilled in the art to combine Chen and Fujikawa. Indeed, after reading Fujikawa and Chen, one of ordinary skill in the art would have found no motivation, teaching, or suggestion to combine the teachings of Fujikawa and Chen to produce the cluster tools recited in Claims 1 and 19. [Moslehi Decl. ¶ 30]. For this reason, the rejection of Claims 1-10, 13, 15-17, 19-20, 22-25, and 29 was improper.

Furthermore, Claims 11-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa and further in view of U.S. Patent Number 6,235,634 to White *et al.* (White). Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa and further in view of U.S. Patent Number 6,244,121 to Hunter. Claim 25 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Fujikawa and further in view of U.S. Patent Number 6,186,722 to Shirai. Claims 11-12, 14, and 25 depend from Claim 1 and, as stated above, for purposes of this appeal, stand or fall with Claim 1. Accordingly, the teachings of White, Hunter, and Shirai are irrelevant and are not discussed in this Appeal Brief.

a. Fujikawa discloses a stand-alone high-pressure processing chamber and provides no motivation to combine a supercritical and non-supercritical processing module in a cluster tool.

Fujikawa is directed to a stand-alone high-pressure processing chamber that reduces the chances of leakage. [Fujikawa, Abstract] In the Summary of the Invention, Fujikawa states that its object is to “ensure the sealing property and safety . . . in an apparatus for processing plate-like workpieces [such] as Si wafers sheet by sheet with a high-pressure gas.” [Fujikawa, col. 3, lines 11-14] In this same section, Fujikawa stresses where the invention lies:

The sealing means fitted to the contact parts of the vessel components is combined with the pressing means for pressing the vessel components in the axial direction thereof, whereby the sealing property in the divided part of the vessel components is more ensured to prevent a leakage of the gas introduced into the processing space.

Id., col. 3, lines 29-35.

Elsewhere in the Summary of the Invention, Fujikawa teaches further structure for keeping the processing chamber properly sealed:

The above-mentioned pressing means is formed of a ram using gas pressure having a pressure medium chamber to which the pressurized gas of the gas introducing means can be introduced, and the pressure receiving area of the ram is set larger than the pressure receiving area of the processing space. By adapting such a structure, the gas of the same pressure as the gas filled in the high-pressure gas processing space is basically introduced into the gas pressure ram, so that the upper and lower vessel components are regularly kept in the mutually closely fitted state at the parting plane so long as the gas pressure is supplied, and the high-pressure gas within the high-pressure gas processing space can be prevented from being leaked through the parting plane to the outside by the synergistic effect with the sealing effect on the seal ring which is the elastic body.

Id., col. 4, lines 27-41.

Claim 1 of Fujikawa recites elements of a processing chamber that can be sealed in accordance with the invention: (1) a high-pressure vessel comprising multiple vessel components that form a closed processing space, (2) an actuator used to move the vessel components in an axial direction, (3) a heater, (4) means for introducing gas into the closed processing space, (5) sealing means, and (6) pressing means for pressing the multiple vessel components in the axial direction.

In the Background of the Invention, Fujikawa makes one passing reference to supercritical processing. (Fujikawa, col. 1, lines 9-10). Nowhere else does Fujikawa mention

supercritical processing. It does not teach how to perform supercritical processing. It does not teach how to attach a supercritical processing module to a non-supercritical processing module. It does teach the process steps that would be required to perform supercritical processing alone, or to combine supercritical and non-supercritical processing in a cluster tool. [Moslehi ¶ 18]

b. Chen discloses a degas chamber with no motivation to combine with a high-pressure processing chamber in a cluster tool.

Chen is directed to a method of preventing corrosion in a load-lock chamber used in a processing system. [Chen, Abstract] Chen recognizes that a workpiece transferred from a processing chamber can carry residue that can contaminate a load-lock chamber. *Id.*, col. 2, lines 35-45; col. 5, lines 44-50. Chen discloses a processing system that includes a degas chamber for removing etch residues from a wafer before transferring the wafer to a load-lock chamber that could be corroded by the etch residues. *Id.*, col. 3, lines 43-52.

Chen discloses an apparatus that functions at or near vacuum. [Moslehi Decl. ¶ 19] Chen does not teach a supercritical processing chamber. Nor does Chen teach combining a supercritical processing chamber with a non-supercritical processing chamber on a single cluster tool.

c. On the filing date, one skilled in the art would have found no motivation to combine Fujikawa and Chen to produce the inventions recited in Claims 1 and 29.

Claim 1 recites a transfer module, a supercritical processing module coupled to the transfer module, a non-supercritical processing module coupled to the transfer module, and a transfer mechanism coupled to the transfer module. The transfer mechanism is configured to move a workpiece between the transfer module, the supercritical processing module, and the non-supercritical processing module. Claim 29 recites means for transferring a workpiece into a transfer module, means for supercritical processing, and means for non-supercritical processing. The means for transferring a workpiece transfers the workpiece to both the means for supercritical processing and the means for non-supercritical processing. Thus, both Claims 1 and 29 teach an apparatus for performing both supercritical and non-supercritical processing on a single cluster tool.

As one skilled in the art of cluster tools, Dr. Moslehi states that it would not have been obvious to combine the high-pressure chamber in Fujikawa with the processing system of Chen to produce the apparatus recited in Claims 1 and 29:

Such an integration of two processing modules with substantially different operating pressure regimes (the supercritical module operating at tens to well over 100 atmospheres while the non-supercritical module operating at sub-atmospheric and/or near-vacuum pressures) on a common transfer module requires identifying the supporting integrated process sequences that would benefit from such a cluster integration. The '641 patent application has clearly identified and disclosed such cluster-integrated process applications (for instance, etching the wafer in an etch module, stripping the photoresist and/or cleaning the wafer in a supercritical CO₂ cleaning module, and then depositing a metal layer in a non-supercritical metal deposition module). Moreover, the integration of such vastly different processing modules operating at substantially different pressure regimes on a common transfer module requires taking special precautions and utilizing features to eliminate the possibility of cross-contamination and gas leakage from the supercritical processing module to the nonsupercritical processing module(s) while achieving high processing throughputs.

[Moslehi Decl. ¶ 28]

Such precautions and features would not have been obvious to someone skilled in the art on the filing date. The '641 patent application clearly discloses the required apparatus (e.g., Figure 5⁴) and supercritical processing method (e.g., Figure 3⁵) to enable such high-throughput cluster integration of the supercritical processing module with non-supercritical processing modules on a common transfer module. On the filing date, one skilled in the art would not have tried to integrate Fujikawa's heat-pressure processing apparatus with Chen's vacuum-integrated cluster tool, without a knowledge of the required supercritical processing apparatus design features (Figure 5) and operating sequence (Figure 3) disclosed in the '641 patent application. Such an attempt would certainly fail due to massive cross-contamination and leakage problems.

Id., ¶ 29.

Dr. Moslehi found that there was no suggestion, motivation, or expectation of success to combine Fujikawa and Chen. *Id.*, ¶ 30. One skilled in the art would not have combined

⁴Figure 5 illustrates the preferred semiconductor processing module disclosed in the '641 patent application. [Footnote not in original text]

⁵Figure 3 illustrates a supercritical removal process of the invention described in the '641 patent application. [Footnote not in original text]

Fujikawa and Chen to produce the apparatus recited in Claims 1 and 29. Accordingly, Claims 1 and 29 distinguish over the combination of Fujikawa and Chen and are therefore allowable. Because claims 2-25 depend from claim 1, they are allowable for the same reasons that claim 1 is allowable.

- d. The Final Office Action misconstrues Dr. Moslehi's statements in, among other things, finding it obvious to combine Fujikawa and Chen.

Within the Final Office Action, in the section Response to Amendment, it is incorrectly stated:

Paragraph 15 and 30: One of ordinary skill in the art would have found enough motivation and expectation of success to combine the teachings of Fujikawa and Chen to produce the cluster tool recited in claim1 for the following reasons.

1. Because the process modules in a cluster tool platform interact to each other only through the transfer module, the success of integrating a process module to a cluster tool platform depends essentially, on how it could integrate with the transfer module.
2. Fujikawa discloses a module, which is capable of doing supercritical processing (Col 1 lie 9-10), being capable to be interfaced [sic] to a robot arm in a vacuum chamber (a transfer module) (Col 7 line 25-26) and having short load/unload time (Col 1 line 60-62).
3. Chen discloses a general-purpose cluster tool (Col 1 line 43).

Therefore it is obvious that there would have been a great expectation of success in combining Fujikawa with Chen. Regarding motivation to combine; there has been an industry wide trend for manufacturers to move away from stand alone to cluster tool integrated modules wherever technical, process or economic justification allowed, for the obvious advantages of through put and lack of contamination. There are/were numerous cluster tool platforms where Fujikawa module could be integrated.

These arguments are unpersuasive for at least the following reasons: Paragraph 1 states merely that integration with a transfer module is integral to the success of a cluster tool. The assumption that something is important to patentability does not negate patentability. Paragraph 2 suggests that the apparatus disclosed in Fujikawa is capable of performing supercritical processing. As discussed above, Fujikawa merely mentions supercritical processing in passing. It does not teach how to perform supercritical processing. Nor does it teach how to combine a

supercritical processing module and a non-supercritical processing module on a single cluster tool. Paragraph 3 merely states that Chen discloses a cluster tool. Nowhere is it stated within the Final Office Action how paragraphs 1 through 3 lead to the ultimate conclusion that there would have been great expectation of success in combining Fujikawa and Chen to produce the apparatus recited in Claims 1 and 29 of the '641 patent application.

The argument that there has been an industry-wide trend to form cluster tools is equally unpersuasive. The Applicants have shown why one skilled in the art would have no motivation to combine the prior art to produce the cluster tool claimed in the '641 patent application. Motivation can be found only after one skilled in the art read the '641 patent application and learned how to combine a supercritical with a non-supercritical processing module on a single cluster tool. Accordingly, the Final Office Action impermissibly uses what is taught in the '641 patent application to find a motivation to combine. *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992); *see also* M.P.E.P. § 2143 (8th ed. 2001).

It is further stated: "Paragraphs 27-29: The declarant has emphasized the importance of eliminating gas leaks and asserted that the combination of Chen and Fujikawa will not work. This is not consistent with the assertion in paragraph 18." This is not true. Paragraph 18 of Dr. Moslehi's declaration does not disregard the importance of eliminating gas leaks. Nor does it suggest that Chen and Fujikawa can be combined—they cannot. Thus, it is unclear how paragraphs 27-29 and paragraph 18 are inconsistent.

e. Claim 20 is not directed to an intended use and is allowable.

Within the Final Office Action, it was stated that "with regard to claim 20, the limitation of using CO₂ is directed to an intended use and does not structurally distinguish over Fujikawa. As discussed above, the means to pressurize are disclosed by Fujikawa (Fig 4-36 and Col 8 line 12-25)."

Claim 20 depends from claim 19 and adds the further limitation, "wherein the means for pressurizing comprises a CO₂ pressurizing configuration which comprises a CO₂ supply vessel coupled to a pump which is coupled to the supercritical processing module." Claim 20 recites structure, not intended use. The Final Office Action does not and cannot point to any language that recites intended use.

Moreover, as discussed above, because Claim 20 depends from Claim 1, it is allowable for at least the same reasons that Claim 1 is allowable.

2. Claims 18 and 21 are nonobvious over Chen in view of Fujikawa and Jevtic.

Within the Final Office Action, Claims 18 and 21 were rejected as being unpatentable over Chen, in view of Fujikawa and Jevtic. Within the Final Office Action it is stated that “Chen et al. does not disclose an antechamber coupling the transfer module and the supercritical process module. [¶] Jevtic discloses a combination of a process chamber and an additional robot adapted to be disposed between the transfer chamber connected to the load locks and one or more process chambers which could be the supercritical module.” The Examiner added parenthetically that “Figure 1 112 [of Jevtic] could act like the ante chamber robot and any one of the process modules around it could be a supercritical module” (underlining added). A mere hopeful possibility cannot form the basis of a rejection.

For an obviousness rejection to stand, one skilled in the art must find some teaching, suggestion, or motivation to combine the prior art. Absent this teaching, suggestion, or motivation, a section 103 rejection cannot stand. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 664 (Fed. Cir. 2000) (obviousness rejection requires that one of ordinary skill find some teaching, suggestion, or motivation to combine prior art). Here, the Final Office Action offers no teaching, suggestion, or motivation to use the transfer chamber in Jevtic as an antechamber as disclosed in the ‘641 application. Accordingly, Claim 18 is allowable over the cited prior art. Moreover, because claim 21 depends from claim 18, it is allowable as depending on an allowable base claim.

Nevertheless, even though the Applicants are not required to do so⁶, they offer evidence that it would not have been obvious to one skilled in the art to use the transfer chamber in Jevtic as an antechamber.

⁶“If the examiner does not produce a *prima facie* case [of obviousness], the applicant is under no obligation to submit evidence of nonobviousness.” M.P.E.P. § 2142 (8th ed. 2001). The first element of a *prima facie* case of obviousness is that there be some suggestion or motivation to combine the references. No such showing has been made here.

a. Jevtic discloses a priority-based scheduling system having a transfer chamber and a buffer chamber.

Jevtic is directed to an apparatus and method “for performing priority based scheduling of wafer processing within a multiple chamber semiconductor wafer processing system (cluster tool). The sequencer assigns priority values to the chambers in a cluster tool, then moves wafers from chamber to chamber in accordance with the assigned priorities.” [Jevtic, Abstract] In Figure 1, cited within the Final Office Action, Jevtic discloses a buffer chamber, a preclean chamber, a cooldown chamber, a transfer chamber, and multiple process chambers directly coupled to the transfer chamber. [Jevtic, Figure 1] Jevtic teaches that “[t]he transfer chamber 112 is surrounded by and has access to the four process chambers 104, 106, 108, 110 as well as the preclean chamber 114 and the cooldown chamber 102.” [Jevtic, col. 1, lines 51-53] Jevtic does not teach that any of the process chambers can perform supercritical processing or even elevated pressure processing.

b. The ante-chamber recited in Claim 18 is not similar to the transfer chamber in Jevtic.

Claim 18 ultimately depends from Claim 1 and recites the additional limitation, “further comprising an ante-chamber coupling the transfer module and the supercritical processing module.” In operation, a workpiece is transferred from the transfer chamber to the ante-chamber. ‘641 application, page 7, lines 29-30. The ante-chamber is then pressurized with carbon dioxide (*id.*, lines 30-32), which, in order to achieve the stated goal of maximizing throughput (the ‘641 patent application, page 4, lines 4-5), should take as little time as possible. Next, the workpiece is transferred from the ante-chamber to the supercritical processing module. *Id.*, page 7, line 32 to page 8, line 1. Next, the ante-chamber is evacuated by a vacuum pump (*id.*, page 8, lines 2-3), a step that should also be minimized to achieve the stated goal of maximizing throughput. Accordingly, the ante-chamber is defined both by its position, allowing access to a supercritical processing module, and by its size, allowing for quick pressurizing and depressurizing, thus achieving a stated goal in the ‘641 application of increasing throughput.⁷

⁷Within the Final Office Action, inconsistent positions are stated. First, on page 3, in regard to Claim 1, it is stated that higher throughput would have suggested to one skilled in the

After reading the '641 application, one skilled in the art found the ante-chamber recited in claim 18 has a small volume that is needed to prevent leakage and cross-contamination between the non-supercritical and supercritical modules. [Moslehi Decl., ¶ 31] The transfer chamber illustrated in Jevtic serves a different purpose as the ante-chamber recited in Claim 18 of the '641 application. Specifically, Dr. Moslehi states why it would not have been obvious to one skilled in the art to use the transfer chamber in Jevtic as an ante-chamber:

The assumption is that the transfer chamber 112 illustrated in Figure 1 of Jevtic can function as an antechamber. This assumption would not have been obvious to one skilled in the art for a number of reasons. First, the Applied Materials Endura system in Jevtic is a staged vacuum cluster tool system and there is no mention of using the second handler as an antechamber for supercritical processing modules. An ante-chamber or buffer/isolation chamber as outlined in the '641 patent application is a very small volume chamber connected to only one supercritical processing module on one end, while connecting to the transfer chamber on the other end. The requirement of a small volume is essential for maximizing throughput and minimizing cross-contamination between the supercritical processing module and other non-supercritical processing modules. The transfer chamber 112 in Jevtic (Endura's staged vacuum central wafer handler) fundamentally does not meet the requirements for a supercritical processing ante-chamber since (a) it has a very large volume, (b) it has multiple access ports, and (c) it does not meet the low-volume requirement for fast throughput and negligible cross-contamination. Thus, on the filing date, it would not have been obvious to one skilled in the art to combine Jevtic, Chen, and Fujikawa to produce a cluster tool having supercritical modules, non-supercritical modules, and an ante-chamber since the resulting outcome falls far short of meeting the intended requirements (reduced cross-contamination and increased throughput). If one skilled in the art used Jevtic's cluster tool and attached Fujikawa's processing system to it by using the staged transfer chamber as an ante-chamber, the combined system would not be practical for manufacturing applications.

Id., ¶ 32.

Indeed, if the transfer chamber in Jevtic were modified to have a small volume, as the ante chamber recited in claim 18, it would be rendered useless for its intended purpose. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (A rejection under § 103 is improper if the prior art

art to couple a supercritical and a non-supercritical module using a transfer module. However, later within the Final Office Action, Dr. Moslehi's statement that higher throughput requires that the ante-chamber have a small volume is ignored. It is both inconsistent and unfair to argue that high throughput is a valid factor supporting a § 103 rejection, yet an irrelevant factor in helping explain how one in the art would interpret language in the specification.

must be modified to sustain the § 103 rejection and the modification renders the prior art useless for its intended purpose.). As Dr. Moslehi describes above, the ante-chamber recited in claim 18 must be small to maximize throughput, adjoining the transfer chamber and a single processing module. In contrast, the transfer chamber in Jevtic “is surrounded by and has access to the four process chambers as well as the preclean chamber and the cooldown chamber.” [Jevtic, col. 1, lines 51-53, reference numbers omitted] Thus, because the transfer chamber in Jevtic is a common chamber allowing access to multiple chambers, it must be correspondingly large. If the transfer chamber in Jevtic were modified to perform the same function as the ante chamber recited in claim 18, the transfer chamber would access only one and not multiple process modules. It thus would be rendered useless for its intended purpose: providing a common area that provides access to multiple processing modules.

The ‘641 application itself emphasizes the distinction between the ante-chamber recited in claim 18 and the transfer chamber of Jevtic. Throughout, the ‘641 application uses the word “antechamber” (e.g., page 6, line 22; page 7, line 26) and the phrase “transfer module” (e.g., page 6, line 21; page 7, line 26). The ‘641 application does not describe a first transfer chamber and a second transfer chamber. The use of different phrases within the ‘641 patent application recognizes the use of both a transfer module and an ante chamber, each having a separate function.

For the above reasons, one skilled in the art would not use the transfer chamber described in Jevtic for the ante-chamber recited in claim 18. Accordingly, claim 18 is allowable over Chen in view of Fujikawa and Jevtic. Moreover, because Claim 21 depends from Claim 18, it too is allowable as depending from an allowable base claim.

Within the Final Office Action, it is stated that the phrase “very small” is indefinite. The Final Office Action thus raises an objection usually reserved for claim language. Nevertheless, under Federal Circuit law, a phrase is not indefinite if it could be understood by those skilled in the art after reading the ‘641 application. *Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1119 (Fed. Cir. 2002) (holding that the claim language “substantially” is not indefinite if it would have been understood by those skilled in the art after reading the specification).

Furthermore, withing the Final Office Action, it is stated in responding to paragraph 17 of Dr. Moslehi’s declaration; “As per declarant’s definition, an ante-chamber is a buffer or isolation chamber, identified more by its disposition than by its special characteristics. The transfer

chamber (Fig 1-112) disposed between (116) and a process chamber (110) as disclosed by Jevtic could function as an ante-chamber.” As explained above, the ante-chamber recited in Claim 18 of the ‘641 patent application is defined by its placement and by its size. Thus, the transfer chamber disclosed in Jevtic could not function as an ante-chamber.

c. The requirement that the ante-chamber is small relative
to the processing modules is not new matter.

At page 8 of the Final Office Action, it is stated: “Paragraph 31 and 32: The declarant and applicant have assumed the ante-chamber to be a very small volume. This is a new matter [sic] and there is no disclosure of this in the specification or the claim. Moreover, ‘very small volume’ is indefinite.” This conclusion is incorrect for at least three reasons.

First, as described above, after reading the ‘641 application, one of ordinary skill in the art would interpret the term “ante-chamber” as being small relative to the processing modules.

Second, the drawings of the ‘641 application teach that the ante-chamber is small relative to the processing modules. Figure 6 of the ‘641 application supports this interpretation, depicting an ante-chamber 77 having a small volume in relation to the transfer module 72. Under Federal Circuit law, a drawing can support a claim limitation if it teaches the claim limitation to one skilled in the art. *See, e.g., In re Heinle*, 342 F.2d 1001, 1007 (C.C.P.A. 1965) (finding that amending specification to recite approximate dimensions depicted in drawings in not new matter). Thus, for the additional reason that Figure 6 depicts an ante chamber having a small volume relative to the transfer chamber, and would be so interpreted by one skilled in the art, the phrase “small volume” is not ambiguous.

3. Claim 30 is patentable over Maydan in view of Fujikawa.

Within the Final Office Action, Claim 30 has been rejected as being unpatentable over Maydan in view of Fujikawa. Within the Final Office Action it is stated that “Maydan discloses a hand off station (Fig 1-14), several non-supercritical modules coupled to the hands off station, a transfer mechanism configured to move the work piece between the entrance and the modules coupled to it. [¶] Maydan et al do not disclose a supercritical module coupled to the hand off

station. [¶] Fujikawa et al discloses a module capable of doing supercritical processing (Col 1 line 9-14). Therefore it would have been obvious to one having ordinary skill in the art to couple the supercritical module to the transfer module of Chen et al [read, Maydan et al] to combine supercritical processing step with other processing on a wafer without taking the wafer out of clean environment between steps.”

Claim 30 recites a hand-off station, a supercritical processing module coupled to the hand-off station, a non-supercritical processing module coupled to the hand-off station, and a transfer mechanism coupled to the hand-off station and configured to move a workpiece between the hand-off station, the supercritical processing module, and the non-supercritical processing module.

a. Maydan merely discloses a vacuum-integrated cluster tool.

Maydan discloses “[a]n integrated modular multiple chamber vacuum processing system. . . The system includes a load lock, may include an external cassette elevator, and an internal load lock wafer elevator, and also includes stations about the periphery of the load lock for connecting one, two or several vacuum process chambers to the load lock chamber.” [Maydan, Abstract]

b. Claim 30 is nonobvious over Maydan in view of Fujikawa.

Maydan discloses a vacuum-integrated cluster tool that is incapable of performing supercritical and non-supercritical processing. [Moslehi Decl. ¶ 33] As Dr. Moslehi explains:

The combination of Maydan’s cluster tool and Fujikawa’s heat pressure processing system also falls far short of the claimed cluster integrated system comprising supercritical processing and non-supercritical processing modules. A direct integration of Fujikawa’s heat pressure processing system on Maydan’s cluster tool will not provide the result produced by the apparatus recited in claim 30 of the ‘641 patent application. Again combining a supercritical processing module and a non-supercritical processing module on a cluster tool platform would not have been obvious to one skilled in the art on the filing date without the process integration drivers being identified, as in the ‘641 patent application. The combination of Maydan and Fujikawa does not teach how to perform

supercritical cleaning or how to conduct a sequence of supercritical and non-supercritical process steps. Without a knowledge of the process apparatus of Figure 5 and the process sequence in Figure 3 of the '641 patent application, the combination of Maydan and Fujikawa on a cluster platform would fail; the cluster tool disclosed by Maydan would not operate properly in combination with Fujikawa's system and there would be massive cross-contamination and leakage between different modules. The cluster tool would simply fail and not operate properly.

[Moslehi Decl. ¶ 33]

Dr. Moslehi concludes that on the filing date, one of ordinary skill in the art would have had no suggestion, motivation, or expectation of success to combine Maydan and Fujikawa. Accordingly, claim 30 is non-obvious over the cited prior art and accordingly is allowable.

C. CONCLUSION

For the above reasons, it is respectfully submitted that the claims 1-25, 29, and 30 are allowable over the cited prior art references. Therefor, a favorable indication is respectfully requested.

IX. APPENDIX

A. Clean copy of the claims under appeal

- 1 1. An apparatus for supercritical processing of a workpiece comprising:
 - 2 a. a transfer module having an entrance;
 - 3 b. a supercritical processing module coupled to the transfer module;
 - 4 c. a non-supercritical processing module coupled to the transfer module; and
 - 5 d. a transfer mechanism coupled to the transfer module, the transfer mechanism
 - 6 configured to move the workpiece between the entrance, the supercritical
 - 7 processing module, and the non-supercritical processing module.

- 1 2. The apparatus of claim 1 wherein the entrance of the transfer module comprises a
2 hand-off station.

- 1 3. The apparatus of claim 2 wherein the entrance of the transfer module further
2 comprises an additional hand-off station.

- 1 4. The apparatus of claim 1 wherein the transfer module operates in vacuum and
2 further wherein the entrance of the transfer module comprises a loadlock.

- 1 5. The apparatus of claim 4 wherein the entrance of the transfer module further
2 comprises an additional loadlock.

1 6. The apparatus of claim 1 wherein the non-supercritical processing module
2 comprises a semiconductor processing module.

1 7. The apparatus of claim 6 wherein the semiconductor processing module is
2 selected from the group consisting of an etch module, a physical vapor deposition
3 module, a chemical vapor deposition module, an electroplating module, a chemical
4 mechanical planarization module, a photolithography module, and an other
5 semiconductor processing module.

1 8. The apparatus of claim 1 wherein the transfer mechanism comprises a robot.

1 9. The apparatus of claim 8 wherein the transfer module comprises a circular
2 configuration.

1 10. The apparatus of claim 9 wherein the robot comprises a central robot, the central
2 robot occupying a center of the circular configuration.

1 11. The apparatus of claim 8 wherein the transfer module comprises a track
2 configuration.

- 1 12. The apparatus of claim 11 wherein the robot comprises a tracked robot, the
- 2 tracked robot comprising the robot coupled to a track such that the robot moves along the
- 3 track in order to reach the supercritical processing module and the non-supercritical
- 4 processing module located along the track.

- 1 13. The apparatus of claim 8 wherein the robot comprises an extendable arm and an
- 2 end effector.

- 1 14. The apparatus of claim 13 wherein the robot further comprises an additional arm
- 2 and an additional end effector.

- 1 15. The apparatus of claim 1 wherein the first supercritical processing module
- 2 comprises a pressure vessel.

- 1 16. The apparatus of claim 15 wherein the pressure vessel comprises a workpiece
- 2 cavity and a pressure vessel entrance, the workpiece cavity holding the workpiece during
- 3 supercritical processing, the pressure vessel entrance providing ingress and egress for the
- 4 workpiece.

- 1 17. The apparatus of claim 16 wherein the transfer mechanism is configured to place
- 2 the workpiece in the workpiece cavity.

1 18. The apparatus of claim 16 further comprising an ante-chamber coupling the
2 transfer module and the supercritical processing module.

1 19. The apparatus of claim 1 further comprising means for pressurizing the
2 supercritical processing module.

1 20. The apparatus of claim 19 wherein the means for pressurizing comprises a CO₂
2 pressurizing configuration which comprises a CO₂ supply vessel coupled to a pump
3 which is coupled to the supercritical processing module.

1 21. The apparatus of claim 18 further comprising means for sealing, the means for
2 sealing operable to seal the pressure vessel entrance.

1 22. The apparatus of claim 1 wherein the transfer module further comprises means for
2 producing a vacuum within the transfer module.

1 23. The apparatus of claim 1 wherein the transfer module further comprises means for
2 maintaining a pressure in the transfer chamber configured to be a slight positive pressure
3 relative to a surrounding environment.

1 24. The apparatus of claim 23 wherein the means for maintaining the slight positive
2 pressure in the transfer module comprise an inert gas injection arrangement.

1 25. The apparatus of claim 1 further comprising means for controlling such that the
2 means for controlling directs the transfer mechanism to move the workpiece.

3 29. An apparatus for supercritical processing a workpiece comprising:
4 a. means for transferring the workpiece configured to transfer the workpiece into a
5 transfer module;
6 b. means for supercritical processing configured such that in operation the means for
7 transferring transfers the workpiece to the means for supercritical processing and
8 further such that in operation the means for supercritical processing processes the
9 workpiece; and
10 c. means for non-supercritical processing configured such that in operation the
11 means for transferring transfers the workpiece to the means for non-supercritical
12 processing and further such that in operation the means for non-supercritical
13 processing processes the workpiece.

1 30. An apparatus for supercritical processing of a workpiece comprising:
2 a. a hand-off station;
3 b. a supercritical processing module coupled to the hand-off station;
4 c. a non-supercritical processing module coupled to the hand-off station; and
5 d. a transfer mechanism coupled to the hand-off station, the transfer mechanism
6 configured to move the workpiece between the entrance, the supercritical
7 processing module, and the non-supercritical processing module.

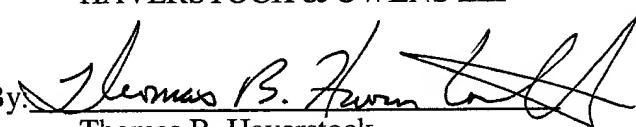
B. Attachments

The following documents, which are part of the record, are attached for convenience:

1. U.S. Patent Serial No. 6,110,232 to Chen *et al.*
2. U.S. Patent Serial No. 5,979,306 to Fujikawa *et al.*
3. U.S. Patent Serial No. 5,928,389 to Jevtic
4. U.S. Patent Serial No. 5,882,165 to Maydan *et al.*
5. Declaration Of Dr. Mehrdad Moslehi Under 37 C.F.R. § 1.132 To Overcome Rejections Under 35 U.S.C. § 112, ¶ 1, And 35 U.S.C. § 103

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: 2 - 20 - 03

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CERTIFICATE OF MAILING (37 CFR § 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner for Patents, Washington D.C. 20231

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